



FSH 1909.12 – LAND MANAGEMENT PLANNING HANDBOOK

CHAPTER 30 – MONITORING

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Digest:

30 – Revises chapter in its entirety. Changes chapter caption from “Public Participation and Collaboration” to “Monitoring.” Removes codes, captions and obsolete direction, and establishes codes, captions, and sets forth new direction throughout the chapter.

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This chapter describes the plan monitoring program, broader-scale monitoring strategy, and biennial evaluation of the monitoring information for land management planning. For ease of reference, Forest Service regulations for National Forest System (NFS) Land Management Planning implementing the requirements of section 6 of the National Forest Management Act of 1976 are set out in boldface type and block-indented.

30.2 - Objective

The objective of monitoring a land management plan is to enable the responsible official to determine if a change in plan components or other plan content on the plan area may be needed.

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(3) *Monitoring.* Monitoring is continuous and provides feedback for the planning cycle by testing relevant assumptions, tracking relevant conditions over time, and measuring management effectiveness (§ 219.12). The monitoring program includes plan-level and broader-scale monitoring. The plan-level monitoring program is informed by the assessment phase; developed during plan development, plan amendment, or plan revision; and implemented after plan decision. The regional forester develops broader-scale monitoring strategies. Biennial monitoring evaluation reports document whether a change to the plan or change to the monitoring program is warranted based on new information, whether a new assessment may be needed, or whether there is no need for change at that time. (36 CFR 219.5)

See 36 CFR 219.12, for monitoring direction related to land management planning. See FSM 1940 for overall direction on monitoring.

This chapter focuses on the monitoring phase of the planning framework, complementing the previous chapters in this Handbook. Chapter 10 of this Handbook provides guidance for the assessment phase that is used to inform the monitoring design. Chapter 20 of this Handbook provides guidance for the land management planning process, where the plan monitoring program questions and associated indicators are developed and established as part of the plan.

Monitoring forms the basis for continuous improvement of the plan and information for adaptive management of the plan area. The purpose of monitoring in an adaptive management framework is to facilitate and prioritize learning to support decisions on whether changes are needed. The plan monitoring program enables the responsible official to determine where changes are needed in plan components, other plan content, and plan implementation strategies that guide resource management in the plan area. Monitoring also helps inform where to make improvements in the plan monitoring program and broader-scale monitoring strategy.

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A plan-level and broader-scale monitoring approach is used for monitoring the plan area to determine whether the land management plan needs to be changed:

1. The responsible official develops the plan monitoring program as part of the plan. The plan monitoring program identifies the monitoring questions and associated indicators for monitoring the plan, using both plan-level and relevant broader-scale monitoring to address the questions and associated indicators.
2. The regional forester develops the broader-scale monitoring strategy for monitoring questions identified by land management plans in the region that can be answered best at a geographic scale broader than one plan area. The broader-scale monitoring information is used to address plan monitoring questions where relevant.

31.1 - Best Available Scientific Information for Monitoring

The responsible official must document how the best available scientific information (BASI) is used to inform the development of the plan monitoring program in the decision document for the plan. Documentation needs to identify what BASI was used, explain the basis for the determination of the BASI, and describe how the BASI was applied. See 36 CFR 219.3 and FSH 1909.12, chapter 40, section 42.13. See section 32.1 of this chapter for other information that may be used in developing the plan monitoring program.

31.2 - Public Participation for Monitoring

The responsible official shall provide opportunities for the public to participate in developing the plan monitoring program during the development or revision of plans. The intent of public participation is to develop a shared sense of ownership and support for the monitoring questions and associated indicators, to provide opportunities to design and carry out multi-party monitoring, to learn of other monitoring information available, and to improve the plan monitoring program. See 36 CFR 219.4 and FSH 1909.12, chapter 40, section 43.

31.3 - Tribal Consultation for Monitoring

Consultation with tribal officials from federally recognized Tribes and Alaska Native Corporations during the plan development phase must include consultation on the development of the plan monitoring questions and associated indicators for the plan monitoring program. See 36 CFR 219.4 and FSH 1909.12, chapter 40, section 44.

32 - PLAN MONITORING PROGRAM

- (a) *Plan monitoring program.* (1) The responsible official shall develop a monitoring program for the plan area and include it in the plan. Monitoring information should enable the responsible official to**

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determine if a change in plan components or other plan content that guide management of resources on the plan area may be needed. The development of the plan monitoring program must be coordinated with the regional forester and Forest Service State and Private Forestry and Research and Development. Responsible officials for two or more administrative units may jointly develop their plan monitoring programs.

(2) The plan monitoring program sets out the plan monitoring questions and associated indicators. Monitoring questions and associated indicators must be designed to inform the management of resources on the plan area, including by testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions or objectives. Questions and indicators should be based on one or more desired conditions, objectives, or other plan components in the plan, but not every plan component needs to have a corresponding monitoring question.

(3) The plan monitoring program should be coordinated and integrated with relevant broader-scale monitoring strategies (paragraph (b) of this section) to ensure that monitoring is complementary and efficient, and that information is gathered at scales appropriate to the monitoring questions. (36 CFR 219.12)

The plan monitoring program sets out the plan monitoring questions and associated indicators to meet the requirements of 36 CFR 219.12.

1. The plan monitoring program must:
 - a. Use the BASI to inform the plan monitoring program and subsequent decisions based on monitoring information.
 - b. Provide opportunities for public participation, collaboration, and multi-party monitoring in the development and implementation of monitoring for the plan area.
 - c. Make data sets and results transparent, consistent, and available to the public where possible. Must design relevant questions and associated indicators to measure management effectiveness and assess progress towards the desired conditions or objectives.
 - d. Test relevant assumptions, track relevant conditions over time, and measure management effectiveness to inform management of resources on the plan area.

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- e. Must be designed to be implemented within the financial and technical capabilities of the Agency.
2. The plan monitoring program should:
 - a. Build from existing internal and external monitoring efforts to design and carry out monitoring for the plan.
 - b. Integrate complementary monitoring information with partners to gain efficiencies for adaptive management across the landscape including data collection methodologies that facilitate data aggregation across units or with partners.
 - c. Include relevant information gathered through project and activity monitoring, and information gathered through plan monitoring should be used to inform development of projects or activities.
 - d. Build public trust to support adaptive management.

32.1 - Developing the Plan Monitoring Program

The process for developing the plan monitoring program should start early in the planning process. The responsible official may start identifying potential monitoring questions and associated indicators in the assessment phase, but shall develop and select the monitoring questions and associated indicators during the plan development phase.

The plan monitoring program consists of a set of monitoring questions and associated indicators to evaluate whether plan components are effective and appropriate and whether management is being effective in maintaining or achieving progress toward the desired conditions and objectives for the plan area. The responsible official has the discretion to set the scope, scale, and priorities for plan monitoring within the financial and technical capabilities of the Agency, but shall include monitoring questions and indicators for the eight items set out in the planning rule at 36 CFR 219.12(a)(5); see section 32.13 of this chapter.

Plan components form the basis for developing the monitoring questions and associated indicators in the plan monitoring program, see sections 32.11 and 32.12 of this chapter. Desired conditions and objectives should be stated in terms that are specific enough to determine whether progress toward their achievement is being made. In addition, standards and guidelines should be stated in terms that are specific enough to determine whether or not they are effective in achieving their purpose.

The responsible official has discretion to determine the methodology and scale of rigor needed to achieve credible monitoring information, ranging from statistically tested methods to professional observation and judgment. National inventory and monitoring protocols should be

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used to provide standard data collection, where appropriate, to provide consistency across the Agency.

The responsible official should use available public and governmental information in developing the plan monitoring program where it is relevant and appropriate. Such information would include traditional ecological knowledge, land ethics, cultural issues, and sacred and culturally significant sites. The responsible official shall protect the confidentiality of sensitive information when required by law.

Exhibit 01, Example of a Subset of a Plan Monitoring Program, identifies a sample subset of a possible plan monitoring program that includes selected plan components to monitor, monitoring questions, and indicators associated with each question.

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32.1 – Exhibit 01

Example: Subset - Plan Monitoring Program

<u>Selected Plan Components</u>	<u>Monitoring Questions</u>	<u>Indicators</u>
Conservation and Maintenance of Soil, Water, and Air Resources		
<p>Desired Condition: Watershed conditions are properly functioning.</p> <p>Objective: 50,000 acres in (named) priority watershed(s) improved to xx condition within yy years of plan approval</p>	<p>Are the priority watershed conditions functioning properly?</p>	<p>Percentage of or amount of: forest cover, riparian area tree and shrub distribution, aquatic biota composition, aquatic habitat continuity, disturbed area (roads, trails, fire lines) condition, area of unstable soils.</p>
<p>Desired Condition: Surface water quality meets or exceeds State standards for aquatic biodiversity and beneficial downstream uses.</p> <p>Standard: Project design must meet or exceed applicable best management practices (BMPs) prescriptions to avoid nonpoint-source pollution.</p>	<p>Are BMPs effective in protecting the most sensitive of the state-designated beneficial uses of surface water, for example native brook trout habitat?</p>	<p>Macroinvertebrate Aggregated Index for Streams score for benthic macroinvertebrates.</p> <p>Qualitative observations to determine if BMPs are implemented and effective.</p>
Conservation of Biological Diversity		
<p>Desired Condition: Healthy longleaf ecosystems, with longleaf pine overstory, open midstory with park-like appearance, and diverse understory of native grasses, legumes and other forbs, appropriately distributed across their native ranges.</p> <p>Objective: Restore 10,000 acres of longleaf ecosystem mid story and maintain 150,000 acres of longleaf ecosystems that currently meet overstory desired</p>	<p>What progress has been made toward maintaining and restoring desired conditions so that native longleaf ecosystems occupy appropriate sites?</p>	<p>Changes in tree abundance, tree age and size distribution, distribution of ecosystem indicator plants, status of red-cockaded woodpecker and gopher tortoise populations in longleaf ecosystems.</p>

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conditions.		
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32.1- Exhibit 01—Continued

<u>Selected Plan Components</u>	<u>Monitoring Questions</u>	<u>Indicators</u>
Conservation of Biological Diversity		
Desired Condition: Alpine ecosystems sustain their diversity and maintain the attributes and processes that allow them to provide watershed values, habitat for native biota, panoramic vistas, and solitude. They display a diverse composition of desirable native plant species and vegetation communities. Invasive plant species are absent or rare.	Are plant communities of alpine ecosystems being protected, maintained, and restored?	Areal extent of plant community of alpine ecosystems. Presence of fragmentation characteristics such as patch size, edge, and proportion of habitat interior. Status of disturbance processes that shape the community.
Maintenance and Enhancement of Social Benefits		
Desired Condition: Recreation settings and opportunities provide high visitor satisfaction, meeting current and future public demands in sustainable ways.	Are the current recreation settings and opportunities moving toward desired recreation settings and opportunities? What is the trend in visitor use and satisfaction?	Recreation Opportunity Spectrum (ROS) acres, location, and distribution (mapped ROS). Satisfaction levels from National Visitor Use Monitoring (NVUM) data.

32.11 - Selecting Monitoring Questions

Monitoring questions should focus on providing the information necessary to evaluate whether plan components are effective and appropriate and whether management is being effective in maintaining or achieving progress toward the desired conditions and objectives for the plan area. A monitoring question is not necessary for every desired condition, objective, or other plan component.

When selecting monitoring questions, the responsible official should evaluate whether questions will provide useful information to inform future plan decisions and provide rationale for the selected set of questions. The responsible official may select as many monitoring questions as the unit, in conjunction with partners, is capable of addressing, as part the broader-scale

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monitoring program. The plan monitoring program must be within the financial and technical capability of the administrative unit. Consider the following questions:

1. Which desired conditions and objectives, or other plan components, need to be monitored to evaluate the effectiveness of the plan and management of resources on the plan area?
2. What specific elements of the selected desired conditions and objectives need to be monitored to determine status and trends of resources in the plan area?
3. Have projects and activities been effective in achieving or maintaining the selected desired condition and objectives?
4. What underlying plan component assumptions and relevant changes in the plan area need to be validated or tracked for the desired conditions and objectives?
5. Is there a high degree of uncertainty associated with management assumptions used in the planning process that monitoring could reduce for future plan decisionmaking?
6. Can monitoring questions contribute to a broader understanding of the relationship between the plan area and the lands surrounding it?
7. Can measurable, efficient, and cost effective indicators for each question be identified?
8. Can information for questions or indicators be provided through broader-scale monitoring programs or data sets available from other sources?
9. Can partnering or multi-party monitoring increase the Agency's ability to answer a monitoring question that maybe unfeasible otherwise?

32.12 - Selecting Monitoring Indicators

Indicators are performance measures used in answering the selected monitoring questions (see FSM 1905 for the definition for "indicator"). The plan monitoring program must include at least one indicator for each monitoring question. The responsible official should choose indicators for which the Agency by itself or with partners can afford to collect the associated data. In addition, the indicators should be practical, measurable, and relevant to answering the monitoring questions for the plan area.

Indicators should be responsive to management activities, or should be chosen to help test relevant assumptions or track relevant changes.

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Whenever possible, indicators should be based on standardized data stored in Forest Service corporate data systems, such as the Natural Resource Manager (NRM), or in official sources from other public agencies, such as the Bureau of Census, in order to facilitate consistency and understanding of conditions across the landscape.

The responsible official may want to set up an agreement if external data sets are used from other parties, to ensure data quality, availability, and duration. The responsible official shall also advise all parties that data provided to the Forest Service in all phases of the planning process may be released under the Freedom of Information Act.

32.13 - Content of the Plan Monitoring Program

(5) Each plan monitoring program must contain one or more monitoring questions and associated indicators addressing each of the following:

(i) The status of select watershed conditions.

(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.

(iii) The status of focal species to assess the ecological conditions required under § 219.9.

(iv) The status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.

(v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.

(vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.

(vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

(viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land (16 U.S.C. 1604(g)(3)(C)). (36 CFR 219.12(a))

The planning rule lists eight items, each of which must be addressed in the plan monitoring program by one or more monitoring question(s) and associated indicator(s). Monitoring questions and associated indicators may be designed to apply to more than one of the required

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items, where appropriate. The plan monitoring program may include additional monitoring questions and associated indicators for other topics not listed in the rule, as the responsible official deems appropriate. A range of monitoring techniques may be used to implement the monitoring requirements.

Specific guidance for the eight listed items in the rule is provided in the following sections.

32.13a - Select Watershed Conditions

The plan monitoring program must contain one or more monitoring questions and associated indicators for plan components that address the status of conditions of select watersheds,

The Watershed Condition Framework should provide a basis for watershed based plan monitoring. Ensure when developing monitoring elements associated with watersheds that they are consistent with, and build upon, the work previously accomplished through the framework process.

Key ecosystem characteristics related to water resources and watershed conditions, such as water quantity, quality, timing, and distribution, may also provide a basis for monitoring watershed conditions to evaluate whether there is progress toward achieving desired plan conditions.

Consider the following when developing the monitoring question(s) and selecting their associated indicator(s) for plan components related to water resources and watershed conditions for the plan area, and determining the frequency of monitoring needed:

1. The appropriate geographic scale relevant to the question(s) to be answered, extending beyond the plan area where appropriate, and taking into consideration source areas for both surface and subsurface water that flows into the plan area and receiving areas for water that flows off the plan area.
2. Potential influences on water resources and watershed conditions from both within and beyond the plan area, including the location, distribution, and aggregate effects of land uses, projects, activities, and other stressors.
3. The general quality of surface and ground water across the plan area and available information on its spatial and seasonal variability.
4. Watersheds and aquifers that serve as public drinking water supplies, including designated Municipal Watersheds under FSM 2542.
5. National BMPs program for water quality.

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6. Relevant information and data sources from Forest Service sources and other Federal, State, and local agencies, Tribes, partners, and others as appropriate.
7. The role, location, and contribution of water resources, including stream courses, water bodies, groundwater, and associated riparian areas, with water availability, quality, or timing concerns potentially affecting sustainability of aquatic ecosystem integrity and existing human uses.
8. The nature, extent, and role of existing and reasonably foreseeable future water withdrawals and associated infrastructure and uses.
9. Water flows and levels needed to sustain the biotic and abiotic integrity of aquatic ecosystems, including groundwater dependent ecosystems.
10. Designated impaired or contaminated waters within or adjacent to the plan area.

Water monitoring should be coordinated with other agencies and partners that have relevant information and/or monitoring programs that overlap with NFS units that may be helpful in meeting the needs for land management plans.

See FSM 2500, associated handbooks and technical guides for more information related to water resources and watershed conditions.

32.13b - Ecological Conditions for Terrestrial, Riparian and Aquatic Ecosystems, and At-Risk Species

The plan monitoring program must contain one or more monitoring questions and associated indicators for addressing measurable changes to the status of select ecological conditions and key ecosystem characteristics across the plan area. The selected set of ecological conditions and key ecosystem characteristics related to the composition, structure, ecological processes, and connectivity of plan area ecosystems (terrestrial, riparian, and aquatic), provide the basis for monitoring ecosystem integrity (36 CFR 219.8(a)(1)) and the diversity of plant and animal communities (36 CFR 219.9).

Watershed condition and the status of the water resources are integral to the ecological integrity of the terrestrial, riparian, and aquatic ecosystems within the plan area. Section 32.13a of this chapter provides direction for monitoring the status of watershed conditions. The monitoring questions and associated indicators related to the status of watershed conditions contribute to the monitoring of the ecological conditions associated with the terrestrial, riparian, and aquatic ecosystems within the plan area.

Ecological conditions associated with the sustainability of ecosystems may relate to the habitat requirements for at-risk species. The set of at-risk species for planning purposes are federally

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recognized threatened, endangered species, proposed, and candidate species; and species of conservation concern. Monitoring questions and associated indicators for the status of select ecological conditions and key ecosystem characteristics of terrestrial, riparian, and aquatic ecosystems required under 36 CFR 219.12(a)(5)(ii) may overlap with those needed for at-risk species required under 36 CFR 219.12(a)(5)(iv). These two rule requirements should be considered together in developing monitoring questions and associated indicators. The same monitoring question and associated indicator(s) may be able to support both requirements.

The plan monitoring program must include one or more monitoring questions and associated indicators for the ecological conditions that relate to at-risk species relevant to the plan area. The monitoring questions and indicators should measure the effectiveness of plan components, both ecosystem and species-specific components that maintain or restore the ecological conditions and key ecosystem characteristics necessary, where practical, to:

1. Contribute to the recovery of threatened and endangered species,
2. Conserve proposed and candidate species, and
3. Maintain viable populations of species of conservation concern within the plan area.

Monitoring questions and associated indicators are developed for the selected ecological conditions and key ecosystem characteristics for ecosystem diversity and ecosystem integrity. Provide indicators that can be periodically measured and assessed to evaluate the implementation of plan components and to determine their effectiveness in achieving desired plan conditions for ecosystem integrity, ecosystem diversity, and at-risk species.

1. The following may be considered when developing monitoring questions and selecting associated indicators relevant to ecosystem integrity, ecosystem diversity, and at-risk species:
 - a. Selecting monitoring questions and associated indicators that assess the effectiveness of plan components specifically developed for ecosystem integrity, ecosystem diversity, and at-risk species. See chapter 20 of this handbook for plan component requirements.
 - b. Selecting monitoring questions and associated indicators describing processes in the watershed. The intent is to identify risks to watershed condition, such as identifying which road segments contribute the most sediment to streams (sec. 32.13a of this chapter).
 - c. Selecting monitoring questions and associated indicators for ecological conditions and key ecosystem characteristics at both the ecosystem and species-specific levels of the terrestrial, riparian, and aquatic ecosystems in the plan area, as appropriate.

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- d. Focusing monitoring questions and associated indicators for at-risk species on ecological conditions related to relevant listing factors and other key risk factors, stressors, and threats that have contributed to the current status of the species.
 - e. The appropriate geographic scale relevant to the question(s) to be answered.
 - f. Potential influences on the ecological conditions and key ecosystem characteristics being monitored from sources both within and beyond the plan area, including the location, distribution, and aggregate effects of land uses, projects, activities, and other stressors.
 - g. Broader-scale monitoring strategies of the Forest Service and other agencies relevant to ecosystem integrity, ecosystem diversity, and at-risk species of the plan area.
 - h. Relevant information and data sources from Forest Service sources and other Federal, State, and local agencies, Tribes, partners and others, as appropriate.
 - i. Selecting monitoring questions and associated indicators that may be among the first affected by stressors, like climate change. These indicators may provide early warnings of ecosystem response to stressors.
 - j. Selecting indicators that are useful in answering more than one monitoring question. For example, measuring progress towards maintaining or restoring longleaf pine ecosystems contributes to monitoring questions related to longleaf pine ecosystem integrity, contributions to recovery of federally listed species (red-cockaded woodpecker, gopher, tortoise, and others), and to maintaining viable populations of species of conservation concern (Bachman's sparrow).
2. When determining the method(s) within the financial and technical capabilities of the Agency to be used to monitor the selected set of ecological conditions and key ecosystem characteristics, the responsible official should consider the following:
- a. The availability of ecological system information or data from sources such as NRM, Forest Inventory and Analysis (FIA), or other agencies and partners, where relevant and practicable.
 - b. Using both remotely sensed information and field collected data where appropriate and currently available.
 - c. Coordinating monitoring efforts with other agencies and partners that have ecological information and, or, monitoring programs that overlap with NFS units that may be helpful in meeting the needs for land management plans.

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d. Existing monitoring strategies and data that adequately address the monitoring questions being asked.

f. Choosing methods in which monitoring data that can be aggregated up to the plan or broader scale monitoring levels

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Every plan monitoring program must identify one or more focal species and one or more monitoring questions and associated indicators addressing the status of the focal species. The purpose for monitoring the status of focal species over time is to provide insight into the following:

1. Integrity of ecological systems on which focal species depend,
2. Effects of management on those ecological conditions,
3. Effectiveness of the plan components to provide for ecological integrity and maintain or restore ecological conditions, and
4. Progress towards achieving desired conditions and objectives for the plan area. It is not expected that a focal species be selected for every element of ecological conditions.

Focal species are not selected to make inferences about other species. Focal species are selected because they are believed to be responsive to ecological conditions in a way that can inform future plan decisions. Categories of species that could be included under the term “focal species” and could serve this ecological purpose include indicator species, keystone species, ecological engineers, umbrella species, link species, species of conservation concern, and others.

The requirement for the responsible official to monitor focal species allows discretion to determine the most appropriate method and geographic scale for monitoring, within the financial and technical capabilities of the unit. Some focal species may be monitored at scales beyond the plan area boundary, while others may be more appropriately monitored and assessed within the plan area. Monitoring focal species is intended to address situations where they provide more value than monitoring other potential indicators.

The responsible official has discretion for determining the monitoring design and methodology used to assess the status of focal species. The design and methodology for monitoring focal species should reflect the BASI and the ecological conditions for which the species is being selected.

1. Selecting focal species may include the following steps and considerations:
 - a. Identifying (FSH 1909.15, ch. 10) the ecological conditions or key ecosystem characteristics to be monitored.
 - b. Identifying threats to ecosystems and stressors related to those characteristics or conditions, including those that may affect ecological conditions relevant to at-risk species.

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- c. Identifying well-recognized keystone species, ecological engineers, and other species with strong ecological interactions with these ecosystems.
 - d. Considering the sensitivity of a species to changing ecological conditions or the species' utility in confirming the existence of desired ecological conditions.
 - e. Considering efficacy of monitoring the species for determining changes in the ecological conditions or key ecosystem characteristics
 - f. Considering the ability for the species to be a more direct and effective measure of ecological characteristics of interest than other potential monitoring indicators.
 - e. Considering the ability of the selected species to provide data for multiple purposes.
 - g. Considering the Agency's ability to effectively and efficiently monitor the species within its technical and financial capabilities.
2. Exhibit 01, Longleaf Pine Forest Ecosystem Example for Monitoring Status of Key Ecosystem Characteristics and Focal Species, shows the relationship between ecological conditions for terrestrial ecosystems and at-risk species, and focal species. The example identifies possible plan monitoring program questions and associated indicators, and shows how the following topics are related:
- a. Desired ecological condition,
 - b. Monitoring question,
 - c. Potential key ecosystem characteristics,
 - d. Possible focal species, and
 - e. Scale to monitor.

For more monitoring examples for key ecosystem characteristics and focal species visit the TIPS (Technical Information for Planning Site) at <http://www.fs.fed.us/TIPS>.

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for Monitoring Status of Key Ecosystem Characteristics and Focal Species****Desired Ecological Conditions** (to maintain or restore):

Vegetation patterns are primarily a product of frequent and low intensity fires and tree harvests resulting in relatively open, park-like pine stands eventually dominated by native, fire dependent longleaf pine communities. The forest canopy ranges from sparse to moderate stocking. The forest typically has long scenic vistas broken by hardwood-lined slopes, creeks, and river bottoms. Other than longleaf pine, few shrubs and mid-story trees grow on the uplands. The native ground cover is continuous and is primarily composed of herbaceous plants dominated by grasses, composites, legumes, and other forbs. Portions of the forest are areas where larger, older trees are interspersed with small, variable patches of younger trees, saplings, seedlings, or small openings. Individuals and clumps of large, old longleaf pine trees are well-distributed across the landscape.

The desired amounts of these indicators for the plan area (acres, percentages, trees/acre, number of suitable red-cockaded woodpecker nest cavity sites/area, fire frequencies, and so forth.) would be established in the desired conditions for the specific plan.

Monitoring Questions:

Is the number of suitable red-cockaded woodpecker nest cavity sites/areas meeting desired conditions?

Are the percentage of trees/acre meeting desired conditions in long-leaf pine ecosystem areas?

The following list provides potential key ecosystem characteristics (indicators for this monitoring question) and possible focal species that may be used to monitor these ecological conditions.

Potential Key Ecosystem Characteristics/ (Indicators):

- Distribution and spatial extent of the longleaf pine forest type.
- Presence, abundance, and spatial distribution of large (>12”) old (>80 years) pine trees.
- Amount and distribution of vegetation seral/structural stages.
- Availability of suitable nesting/roosting cavity sites for red-cockaded woodpeckers.

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- **LONGLEAF PINE** - keystone species for these conditions; changes in areal extent of longleaf pine forest stands.
Monitoring may include querying a unit's database every 2-3 years for total acres in longleaf pine forest.
- **RED-COCKADED WOODPECKER** - endangered species associated with mature longleaf pine stands; changes in number of active cluster sites.
Monitoring for this species may include identifying total number of active clusters within the plan area based upon site visits conducted annually.
- **BACHMAN'S SPARROW** - species of conservation concern associated with grassy understory conditions; changes to area/habitat occupied.
Monitoring for this species may include presence/absence determinations by song surveys conducted every 2-3 years in sample areas randomly selected in established habitat conditions.

Scale (most appropriate for monitoring): large landscape area, management area

32.13d - Visitor Use, Visitor Satisfaction, and Recreation Objectives

The plan monitoring program must contain one or more monitoring questions and associated indicators addressing the status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives. The purpose for monitoring recreation is to evaluate:

1. Progress towards achieving desired conditions and objectives for sustainable recreation,
2. Contributions to social and economic sustainability, and
3. Management consistency with other plan components.

The responsible official may consider plan components for sustainable recreation, recreation opportunities, scenic character, recreation settings, and social and economic sustainability in designing monitoring questions and associated indicators.

The responsible official shall identify one or more monitoring questions, such as:

1. What is the status and trend of visitor use, visitor satisfaction, and progress toward meeting recreation objectives in the plan?

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2. Are the current recreation settings and opportunities meeting or moving toward desired recreation settings and opportunities identified in the plan?
3. Are the recreational objectives identified in the plan being achieved and are they sustainable?
4. Is the set of recreation opportunities effective for connecting people with nature?
5. Was the set of recreation opportunities successfully designed to reduce or minimize user conflict?
6. How are the recreation settings and opportunities contributing to the plan's desired condition(s) and objective(s) for ecological, social, and economic sustainability?
7. Are the existing scenic resources meeting or trending toward desired conditions for the scenic resources?
8. Is the recreation opportunity spectrum on the plan area supporting a sustainable set of recreation opportunities to meet current and future demands?

National Visitor Use Monitoring (NVUM) survey results may be used for visitor-related monitoring. Infrastructure (Infra) recreation site module may be used to monitor opportunities of recreation sites, facilities, and interpretive services.

The interpretive services component of this Infra module and the Forest Service program, NatureWatch, may be used collectively as the basis to monitor whether the plan provides opportunities to connect people to nature.

Coordinate monitoring with other agencies and partners that have relevant information and with monitoring programs that overlap with NFS units that may help meet the needs for land management plans.

32.13e - Climate Change and Other Stressors

The plan monitoring program must contain one or more monitoring questions and associated indicators to address the measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area. This monitoring requirement may relate to other monitoring requirements or to interactions with other stressors that individually or collectively may be affecting the plan area. Interacting stressors may include fire, insects, invasive species, loss of spatial connectivity, disruption of natural disturbance regimes, geologic hazards, water withdrawals and diversions, changes in successional trajectories, and changes in human dimensions within the plan area, among others.

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1. The responsible official may consider the following when developing monitoring questions and indicators to address potential impacts on the plan area:
 - a. Plan area vulnerabilities to projected climate changes and other associated stressors, especially those that are tied to the implementation of plan components.
 - b. Coordinating monitoring needs for the plan with the Agency climate change monitoring requirements.
 - c. Existing monitoring that addresses the status of stressors within the plan area, such as watershed condition monitoring, soil disturbance monitoring, and ongoing forest inventories, repeated over time, that detect changes in forest composition and structure.
 - d. Broader-scale monitoring strategies of the Forest Service and other agencies for climate data and monitoring impacts broader than the planning area. National monitoring programs, such as air monitoring and climate change research, can provide information and be incorporated into monitoring for the plan area.
 - e. Ecosystem characteristics that may change over time, such as a change in precipitation amount or timing, and be affected by stressors, such as insects, disease, fire, or changes in human dimensions within the plan area.
 - f. Identifying monitoring questions and indicators (combined with paragraph 5 of this section) capable of recognizing uncertainty and providing early warnings of ecosystem response to climate change or other stressors. Potential indicators include direct and indirect impacts of changes in natural disturbance regimes, including uncharacteristic drought, flooding, wind, and storm frequency, and severity. Indirect impacts may include insect outbreaks and wildfires in areas impacted by drought, or the spread of invasive species in areas where forest cover is lost due to flooding.
 - g. Selecting indicators of vegetative communities that are likely to be among the first affected by climate change, to help identify opportunities for managing their adaptation.
2. The responsible official has discretion to identify one or more monitoring questions, such as:
 - a. What stressors are impacting the plan area?
 - b. How are trends in stressors affecting the plan area?
 - c. How are these stressors affecting progress towards achieving or maintaining the plan's desired conditions or objectives?

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- d. Are the plan components effectively designed to reduce or adapt to the various projected stressors?
- e. Are there plan components that need to be changed to better respond to climate change and other stressors?

32.13f - Desired Conditions and Objectives

The plan monitoring program must contain one or more monitoring questions and associated indicators to monitor progress toward meeting desired conditions and objectives in the plan, including those that would provide for multiple use opportunities. The intent of this requirement is to monitor progress toward meeting desired conditions, objectives, or other plan components for multiple use management that are not covered by the other monitoring items listed in 36 CFR 219.12(a)(5).

32.13g - Productivity of the Land

The plan monitoring program must contain one or more monitoring questions and associated indicators to determine that the effect of each management system is not to substantially and permanently impair the productivity of the land (16 U.S.C. 1604(g)(3)(c)). To address this requirement, the responsible official should focus on key ecosystem characteristics in the plan area related to soils and soil productivity identified in the assessment and planning process. Productivity is defined as the capacity of NFS lands and their ecosystems to provide the various renewable resources in certain amounts in perpetuity. For the purposes of this subpart, productivity is an ecological term, not an economic term (36 CFR 219.19).

Many scientific studies have been published on effects of silvicultural practices on soil productivity. If research has shown the effect of current practices, there is no need for intensive soil monitoring. A possible monitoring question is whether the silvicultural practices on the plan area are considered appropriate based on existing scientific information?

The responsible official may consider the following when developing monitoring questions and establishing indicators with respect to the productivity of the land:

1. Soil quality monitoring that may include disturbance monitoring as well as measures of chemical and biological properties, and physical properties beyond soil disturbance. Soil quality monitoring guidance is found in FSM 2551.6, and soil disturbance monitoring protocols are described in General Technical Report (GTR) WO-82a.
2. Coordinating with research stations to obtain results from the Long-Term Soil Productivity Study for the region around the plan area, to the extent that results are

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available, to solicit input to the monitoring design and information related to organic matter/carbon loss and soil compaction.

3. Differentiating between resource management and climate change effects on soil productivity.

32.2 - Documenting the Plan Monitoring Program

The plan must include the monitoring questions and associated indicators for the plan monitoring program, including at least the items listed in 36 CFR 219.12(a)(5). The responsible official should summarize the reasons for selecting the monitoring questions and associated indicators in the planning record.

Any additional information for the plan monitoring program may be documented in a separate monitoring guide for the NFS unit, including:

1. The data to be collected for the indicators and the specific methods for data collection (protocols).
2. Information about the data to be collected, or metadata.
3. How the data are managed, analyzed, and evaluated to determine whether the plan components need to be changed.
4. Responsibilities for managing the monitoring program.
5. The schedule of monitoring and evaluation activities during the planning period.
6. Cooperators and their roles with respect to particular monitoring content.

An annual monitoring work plan may be used to identify the monitoring work, consistent with the monitoring guide, for each fiscal year, including the anticipated resources for carrying out the plan monitoring program.

32.3 - Transitioning to the Plan Monitoring Program

... Where a plan's monitoring program has been developed under the provisions of a prior planning regulation and the unit has not initiated plan revision under this part, the responsible official shall modify the plan monitoring program within 4 years of the effective date of this part, or as soon as practicable, to meet the requirements of this section. (36 CFR 219.12(c)(1))

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The plan monitoring program must meet the requirements in 36 CFR 219 and be established by the responsible official in the unit's plan by May 9, 2016, or as soon as practicable. Units that have plans in revision under the 2012 planning rule may defer completion of this requirement until the plan revision is completed. Units that have not initiated plan revision during the 4-year transition period must have monitoring questions and associated indicators in place for the items listed in 36 CFR 219.12(a)(5). While developing the monitoring questions and indicators for the plan monitoring program, units must meet other related rule requirements, such as using the BASI, involving the public, and updating the planning record.

1. In transitioning to the plan monitoring program requirements in 36 CFR 219.12(a), the responsible official may consider:
 - a. Coordinating across the Agency and with partners to develop consistent or complimentary monitoring approaches for the plan monitoring program.
 - b. Assessing where current land management plans already include questions and associated indicators related to the items listed in 36 CFR 219.12(a)(5) for the plan monitoring program.
 - c. Using broader-scale monitoring information where available, such as NVUM and FIA, to help develop efficient questions in the plan monitoring program.
2. In transitioning to the plan monitoring program requirements in 36 CFR 219.12(a), the responsible official should:
 - a. Use an administrative change to establish the plan monitoring program after notice to the public of the intended monitoring program and consideration of public comment.
 - b. Notify the public of the establishment of the plan monitoring program in any way the responsible official deems appropriate and at the same time notify the public of the expected date of the first biennial monitoring evaluation report (to be published no later than 2 years from date of the new monitoring program).

32.4 - Changing the Plan Monitoring Program**(c) Administrative changes. . . .**

(1) A substantive change to the monitoring program made outside of the process for plan revision or amendment may be made only after notice to the public of the intended change and consideration of public comment

(§ 219.16(c)(6)).

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- (2) All other administrative changes may be made following public notice**
(§ 219.16(c)(6)). (36 CFR 219.13)

Administrative changes may be used to change the questions and associated indicators of a plan monitoring program that is established outside of the process for a plan. The responsible official must provide public notice of substantive changes made to the plan monitoring program.

A substantive change is a change to a monitoring question and associated indicator. A non-substantive change is a correction of clerical error. See chapter 20 of this handbook.

A change to a monitoring guide or annual action plan is not an administrative change of the plan and does not require public notification.

33 - BROADER-SCALE MONITORING STRATEGY

(b) *Broader-scale monitoring strategies.* (1) The regional forester shall develop a broader-scale monitoring strategy for plan monitoring questions that can best be answered at a geographic scale broader than one plan area.

(2) When developing a monitoring strategy, the regional forester shall coordinate with the relevant responsible officials, Forest Service State and Private Forestry and Research and Development, partners, and the public. Two or more regional foresters may jointly develop broader-scale monitoring strategies.

(3) Each regional forester shall ensure that the broader-scale monitoring strategy is within the financial and technical capabilities of the region and complements other ongoing monitoring efforts.

(4) Projects and activities may be carried out under plans developed, amended, or revised under this part before the regional forester has developed a broader-scale monitoring strategy. (36 CFR 219.12)

This section refers to broader-scale monitoring as it applies to land management plans.

The purpose of the broader-scale monitoring strategy is to answer plan monitoring questions that can best be answered at a geographic scale larger than one plan area. The regional forester is responsible for developing a broader-scale monitoring strategy for plan monitoring program questions that can be more efficiently answered by broader-scale monitoring on more than one plan area in their region. Two or more regional foresters may jointly develop a broader-scale monitoring strategy to cover more than one region.

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The regional broader-scale monitoring strategy provides an overall strategy for broader-scale monitoring for planning in the region. A regional broader-scale monitoring strategy consists of a set of broader-scale monitoring sub-strategies or elements to answer specific monitoring questions for the appropriate plan areas in the region. Existing monitoring programs at the national and regional levels, such as NVUM and FIA, may be used to provide broader-scale monitoring elements. Elements of the broader-scale monitoring may vary substantially to reflect different levels of scope, scale and extent. For instance, a broader-scale monitoring element may focus on monitoring for a specific resource, program, issue, geographical area, or other topic.

33.1 - Developing the Broader-scale Monitoring Strategy

Regional foresters are encouraged to work together to achieve the appropriate scales for monitoring across the landscape to supply information for the plan monitoring program questions and indicators, in coordination with both internal and external partners. This effort includes coordinating with relevant responsible officials (including those in Forest Service State and Private Forestry and Research and Development), partners, and the public. It is also important to coordinate with other land managers to address broader-scale planning questions from NFS plan monitoring programs.

Broader-scale monitoring strategies should be developed to provide consistent and complementary information to support plan-level monitoring on the plan areas. Broader-scale monitoring should be developed where it is more efficient than plan-level monitoring to inform the management of resources, including testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining desired conditions or objectives.

The process for developing a broader-scale monitoring strategy for land management planning is intended to be iterative, recognizing that it may not be possible for all of the elements of a broader-scale monitoring strategy to be developed at the same time. It is important for regions to coordinate and work together in developing broader-scale monitoring elements and strategies for land management plans where relevant and appropriate.

The process for developing a broader-scale monitoring strategy may include:

1. Determining how the public can participate in developing a broader-scale monitoring strategy.
2. Identifying the monitoring questions and associated indicators from the plan monitoring programs that are best addressed at a larger scale than a plan area.
3. Identifying which NFS units would be included at the appropriate scale(s), looking across regional boundaries where appropriate.

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4. Looking at existing corporate databases, protocols, and monitoring efforts with internal and external partners or other efforts where data sets might be available to help determine how monitoring should be done to answer the relevant monitoring questions.

Exhibit 01, Examples for Developing Broader-scale Monitoring Elements, identifies possible approaches for developing broader-scale monitoring and examples of elements that could be placed in a regional broader-scale monitoring strategy. A broader-scale monitoring strategy could include elements developed through a combination of these approaches or others.

33.1 - Exhibit 01

Examples for Developing Broader-scale Monitoring Elements

<u>Possible Approaches for Developing Broader-scale Monitoring</u>	<u>Examples of Broader-scale Monitoring Elements</u>
<p><u>Broader-scale monitoring developed from the national and regional level.</u> Regional foresters establish a broader-scale monitoring program for meeting national and regional priorities, which provides elements to address plan monitoring questions.</p>	<p>NVUM, Migratory Birds Survey, Threatened and Endangered species (northern spotted owl, red-cockaded woodpecker).</p>
<p><u>Broader-scale monitoring developed by the region, in conjunction with the forests.</u> The regional forester consults with the forest supervisors to identify needs for broader-scale monitoring for the relevant plan areas. The forest supervisors provide the plan monitoring questions, coordinating with the region to identify elements for the broader-scale monitoring strategy to help address these questions.</p>	<p>Regions 8 and 9 FIA vegetation intensified plot strategy based on cumulative information needs identified from forest monitoring questions and other local forest needs.</p>
<p><u>Broader-scale monitoring adopted from external partners.</u> Regional foresters adopt broader-scale monitoring programs or portions of programs developed by external partners to provide elements that address</p>	<p>U.S. Geological Survey (USGS) National Streamflow Information Program (NSIP), EPA Class I Air Monitoring, USGS National Water Quality Assessment Program, County Noxious Weed Monitoring Programs, National Ecological</p>

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plan monitoring questions.

Observatory Network.

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33.1 - Exhibit 01—Continued

<u>Possible Approaches for Developing Broader-scale Monitoring</u>	<u>Examples of Broader-scale Monitoring Elements</u>
<p><u>Broader-scale monitoring developed with partners and the public.</u> Regional foresters jointly develop a large landscape monitoring program with partners and the public to monitor key issues across multiple plan areas.</p>	<p>The Pacific Northwest Region developed a broad-scale monitoring program to address several issues that are found across coastal and Cascade Range National Forests. These issues include trends in old forest habitat, trends in spotted owls and marbled murrelets, watershed health, and information and the distribution of a number of other lesser known plant and animal species. The monitoring program was collaboratively developed with substantial science input to develop rigorous protocols and methods for each major element of the program. Multiple Federal agencies including Bureau of Land Management, National Park Service, Fish and Wildlife Service, and National Marine Fisheries Service have been involved in the development, execution, and evaluation of the monitoring program.</p>

33.2 - Documenting the Broader-scale Monitoring Strategy

The regional forester should document the broader-scale monitoring strategy for the region. Documentation for a broader-scale monitoring strategy may include:

1. Identifying the appropriate monitoring questions and associated indicators for broader-scale monitoring for planning and the appropriate scale and units where these would apply;
2. Identifying the monitoring methods, protocols, and sample designs that are to be used across multiple plan areas (including corporate applications that are used to store data and conduct analysis);
3. Describing how the broader-scale monitoring is to be carried out;
4. Including a feedback mechanism to improve the efficiency and effectiveness of the broader-scale monitoring strategy, looking at the best available scientific information and opportunities to collaborate with partners and the public.

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The regional forester may provide a broader-scale monitoring evaluation report to summarize the findings from the broader-scale monitoring for the NFS units in the region to reference in the biennial monitoring evaluation report. A broader scale monitoring evaluation report is not required.

An evaluation of broader-scale monitoring information applicable to the plan area should be included in the biennial monitoring evaluation report for each NFS unit where relevant. See section 34 below.

34 - BIENNIAL EVALUATION OF THE MONITORING INFORMATION

(d) *Biennial evaluation of the monitoring information.* (1) The responsible official shall conduct a biennial evaluation of new information gathered through the plan monitoring program and relevant information from the broader-scale strategy, and shall issue a written report of the evaluation and make it available to the public.

(i) The first monitoring evaluation for a plan or plan revision developed in accordance with this subpart must be completed no later than 2 years from the effective date of plan decision.

(ii) Where the monitoring program developed under the provisions of a prior planning regulation has been modified to meet the requirements of paragraph (c)(2) of this section, the first monitoring evaluation must be completed no later than 2 years from the date the change takes effect.

(iii) The monitoring evaluation report may be postponed for 1 year in case of exigencies, but notice of the postponement must be provided to the public prior to the date the report is due for that year (§ 219.16(c)(6)).

(2) The monitoring evaluation report must indicate whether or not a change to the plan, management activities, or the monitoring program, or a new assessment, may be warranted based on the new information. The monitoring evaluation report must be used to inform adaptive management of the plan area.

(3) The monitoring evaluation report may be incorporated into other planning documents if the responsible official has initiated a plan revision or relevant amendment.

(4) The monitoring evaluation report is not a decision document representing final Agency action, and is not subject to the objection provisions of subpart B. (36 CFR 219.12)

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The biennial evaluation refers to transforming monitoring data into information that the responsible official may consider to make changes to the plan, management activities, or plan monitoring program, or create a new assessment. At least biennially the responsible official must evaluate the monitoring information, with the intent of using adaptive management to change and improve the plan and the monitoring program as appropriate.

The biennial evaluation of monitoring data may only provide partial answers to some of the monitoring questions in the plan monitoring program. Individual biennial monitoring evaluation reports may be limited to a few plan components, as information that can be evaluated is available. The accumulation of biennial evaluation reports should build on the biennial monitoring evaluation reports that precede them to comprehensively evaluate achievement of the plans desired conditions and objectives. This includes monitoring results collected from both the plan-level and broader-scale for questions identified in the plan monitoring program.

Responsible officials shall issue a written report of the evaluation, inform interested parties about the availability of this report, and provide meaningful opportunities for participation in the review of the results. See section 43 of this Handbook. The biennial monitoring evaluation report only documents findings and is not a decision document.

Exhibit 01, Example of Possible Monitoring Evaluation Questions, identifies potential questions that may be used to evaluate the results of the monitoring information to see if there is a need for a change.

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34 - Exhibit 01

Example of Possible Monitoring Evaluation Questions

1. For all plan components.
 - a. Is there new information?
 - b. Are there changes in legal, regulatory, policy, or science that affect the desired conditions?
2. Desired Conditions.
 - a. Are the desired conditions still valid?
 - b. Are the desired conditions still achievable?
 - c. Are we making progress toward achieving desired conditions?
3. Objectives.
 - a. Are the objectives still valid to achieve the desired conditions?
 - b. Are the objectives being achieved? If not, what is preventing this?
 - c. Do the objectives need to be adjusted or changed to better achieve the desired conditions?
4. Standards and Guidelines.
 - a. Are the standards and guidelines still valid to achieve the desired conditions and objectives?
 - b. Do the standards and guidelines need to be adjusted or changed to better achieve the desired conditions and objectives?
 - c. Are additional standards or guidelines needed to address changing conditions or new threats?
5. Suitability of Lands for Uses or Activities.

Is the determination of suitable lands still valid for the uses or activities identified?
6. Management Areas, Geographic Areas, or Designated Areas.

Is there a need to adjust boundaries, plan components, or management for these areas?

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In preparing the monitoring report:

1. The responsible official shall review the results of the biennial evaluation and indicate if there is a need for change.
2. Based on the evaluation of the new information gathered through the plan monitoring program, including relevant information from the broader-scale monitoring strategy, the responsible official shall document one or more of the following findings in the biennial evaluation report:
 - a. A change may be needed to the plan;
 - b. A change may be needed to the management activities;
 - c. A change may be needed to the monitoring program;
 - d. An assessment may be needed; or
 - e. No amendment, revision, or administrative change is needed.
3. In the monitoring evaluation report, the responsible official may:
 - a. Briefly summarize the monitoring activities conducted;
 - b. Document the evaluation of new information obtained from the plan-level and broader-scale monitoring to answer the relevant monitoring and evaluation questions. Some evaluations may conclude that more monitoring data is needed;
 - c. Summarize new BASI for plan monitoring program questions. Indicate if there is no new information at this time.
 - d. Document how public participation has been involved in the monitoring effort if relevant.
 - e. Document rationale if monitoring has not been completed.
 - f. Document any findings for adaptive management.
 - g. Document any actions taken on findings and, or, conclusions from the previous biennial evaluation report, as relevant and appropriate.